



General Electric Company
175 Curtner Avenue, San Jose, CA 95125

April 6, 1993

Docket No. STN 52-001

Chet Poslusny, Senior Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of the Nuclear Reactor Regulation

Subject: Submittal Supporting Accelerated ABWR Review Schedule - **Section 4.2 COL
Action Items**

Dear Chet:

Enclosed are SSAR markups addressing DFSER COL Action Items: 14.2.3-1, 14.2.3-2, 14.2.3-3, 14.2.3-4, 14.2.4-1, 14.2.5-1, 14.2.10.4-1, 14.2.11-1, 14.2.12.4-1 and 14.2.12.4-2.

We find that COL Action Item 14.2.12.3-1 is no longer required since the corresponding information is now included as a design requirement (See my letter dated February 12, 1993).

Sincerely,

Jack Fox
Advanced Reactor Programs

cc: Norman Fletcher (DOE)
Mike Song (GE)
H. J. Yang (GE)

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14.2.13 COL License Information ~~Initial Test Program~~

14.2.13.1 *Other testing*

~~The preceding discussion of preoperational and startup tests were limited to those systems and components within, or directly related to, the ABWR Standard Plant. Other testing, with respect to site specific aspects of the plant will be necessary to satisfy certain ABWR requirements. Testing of such systems and components shall be adequate to demonstrate conformance to such requirements as defined throughout the specific chapters of the SSAR. Below are systems that may require such testing:~~

- (1) electrical switchyard and equipment;
- (2) the site security plan;
- (3) personnel monitors and radiation survey instruments; and
- (4) the automatic dispatcher control system (if applicable).

14.2.13.2 *Test Procedure / Admin manual will provide*

~~Also to be supplied by the COL applicant is the startup administration manual described in Section 14.2.4, which will describe, among other things, what specific permissions are required for the approval of test results and the permission to proceed to the next testing plateau.~~

14.2.13.3 *Tests exempt from License Conditions*

The COL applicant shall also provide a list of those tests to be performed as part of the power ascension test phase that are proposed to be exempt from operating license conditions requiring NRC prior approval for major test changes. Reg Guide 1.68 specifies criteria (see Regulatory Position C.1) for determining what structures, systems, components and design features are required to be tested during the power ascension test phase in accordance with the requirements therein. Testing of such structures, systems, components and design features is then subject to license conditions requiring NRC approval for major test changes. For completeness, the testing described in Subsection 14.2.12.2 includes testing of a limited number of ABWR structures, systems, components and design features that do not meet the referenced Reg Guide 1.68 criteria, and are thus exempt from such license conditions.

Of the tests described in Subsection 14.2.12.2 for the ABWR Standard Plant the following tests, or designated portions thereof, are thus candidates for proposed exemptions from operating license conditions requiring NRC prior approval for major test changes:

- (1) 14.2.12.2.13 Recirculation Flow Control - except for those features intended to limit maximum core flow;
- (2) 14.2.12.2.21 Reactor Water Cleanup System Performance
- (3) 14.2.12.2.23 Plant Cooling/Service Water System Performance - those portions pertaining to the turbine building and service water systems;
- (4) 14.2.12.2.24 HVAC System Performance - Those portions pertaining to the normal HVAC system and its associated nonessential chilled water system;
- (5) 14.2.12.2.29 Feedwater Pump Trip; and
- (6) 14.2.12.2.39 Steam and Power Conversion System Performance.

The COL applicant shall provide the final list of tests proposed to be exempt from such license conditions, including adoption or augmentation of the above list, as appropriate.

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- Col 14.2.3-1 ⇒ (1) the scoping documents (i.e., preoperational and startup test specifications) containing testing objectives and acceptance criteria applicable to its scope of design responsibility. (See Subsection 14.2.3)
- Col 14.2.3-2 ⇒ (2) the startup administrative manual (procedure) and any other documents which delineate plant operational conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptable data reduction techniques to be reviewed by the NRC at the time of combined operating license. (See Subsection 14.2.3 and 14.2.4)
- Col 14.2.3-3 ⇒ (3) any reconciliation methods needed to account for test conditions, methods or results if testing is performed at conditions other than representative design operating conditions. (See Subsection 14.2.3)
- Col 14.2.3-4 ⇒ (4) the approved preoperational and startup test procedures approximately 60 days before their intended use. (See Subsection 14.2.3)
- Col 14.2.4-1 ⇒ (5) a startup administrative manual (procedure) and any other documents that delineate the conduct of the test program to be reviewed by the NRC at the time of combined operating license. (See Subsection 14.2.4)
- Col 14.2.5-1 ⇒ (6) a startup administrative manual (procedure) and any other documents that delineate the review, evaluation, and approval of test results for the NRC review. (See Subsection 14.2.4)
- Col 14.2.10.4-1 ⇒ (7) a startup administrative manual (procedure) and any other documents that delineate the method of controlling pre-fuel-load-checks, initial fuel loading, precritical testing and initial criticality for the NRC review. (See Subsection 14.2.10)
- Col 14.2.11-1 ⇒ (8) a startup administrative manual (procedure) and any other documents that delineate the test program schedule for NRC review. (See Subsection 14.2.11)

* Col 14.2.12.3-1 : This item is not required since it is included (marked up) in the letter dated 2/12/93 MARKUPC Docket no STN E2-001)

14.2 SPECIFIC INFORMATION TO BE INCLUDED IN FINAL SAFETY ANALYSIS REPORTS

14.2.1 Summary of Test Program and Objectives

The initial test program consists of a series of tests categorized as construction, preoperational, or initial startup tests. The construction acceptance tests determine correct installation and functional operability of equipment. Preoperational tests are those tests normally conducted prior to fuel loading to demonstrate the capability of plant systems to meet performance requirements. Initial startup tests begin with fuel loading and demonstrate the capability of the integrated plant to meet performance requirements.

The objectives of the initial test program are to:

- (1) ensure that the construction is complete and acceptable;
- (2) demonstrate the capability of structures, components, and systems to meet performance requirements;
- (3) effect fuel loading in a safe manner;
- (4) demonstrate, where practical, that the plant is capable of withstanding anticipated transients and postulated accidents;
- (5) evaluate and demonstrate, to the extent possible, plant operating procedures to provide assurance that the operating group is knowledgeable about the plant and procedures and fully prepared to operate the facility in a safe manner; and
- (6) bring the plant to rated capacity and sustained power operation.

14.2.1.1 Construction Test Objectives

Construction tests are performed to demonstrate that components and systems are correctly installed and operational. These tests

include, but are not limited to, flushing and cleaning, hydrostatic testing, initial calibration of instrumentation, checks of electrical wiring and equipment, valve testing, and initial energization and operation of equipment and systems. Completion of this phase will assure that systems are ready for preoperational testing. Abstracts of these tests are not provided as part of this chapter.

14.2.1.2 Preoperational Test Objectives

Preoperational tests are conducted prior to fuel loading in order to verify that plant systems are capable of operating in a safe and efficient manner compatible with the system design bases. The general objectives of the preoperational test phase are as follows:

- (1) ensure that design specification and test acceptance criteria are met;
- (2) provide documentation of the performance and safety of equipment and systems;
- (3) provide baseline test and operating data on equipment and systems for future reference;
- (4) run-in new equipment for a sufficient period so that any design, manufacturing, or installation defects can be detected and corrected;
- (5) ensure that plant systems operate together on an integrated basis to the extent possible;
- (6) give maximum opportunity to the permanent plant operating staff to obtain practical experience in the operation and maintenance of equipment and systems;
- (7) help demonstrate safe and efficient system operating and surveillance testing procedures to the extent possible; and
- (8) demonstrate that systems and safety equipment are operational and that it is possible to proceed to fuel loading and to the startup phase.

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The discussion of preoperational and startup tests describe in this section are limited to those systems and components within, or directly related to, the ABWR standard plant. Other testing, with respect to site specific aspects of the plant will be necessary to satisfy certain ABWR requirements. See Subsection 14.2.13.1 for COL license information requirements.

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will be made available to the NRC staff approximately 60 days prior to their intended use for preoperational tests and 60 days prior to scheduled fuel loading for power ascension tests.

→ See Subsection 14.2.13.2 for COL License Information requirements.

14.2.4 Conduct of Test Program

The initial test program is conducted by the startup group in accordance with the startup administrative manual. This manual contains the administrative procedures and requirements that govern the activities of the startup group and their interfaces with other organizations. The startup administrative manual receives the same level of review and approval as do other plant administrative procedures. It defines the specific format and content of preoperational and startup test procedures as well as the review and approval process for both initial procedures and subsequent revisions or changes. The start-up manual also specifies the process for

review and approval of test results and for resolution of failures to meet acceptance criteria and of other operational problems or design deficiencies noted. It describes the various phases of the initial test program and establishes the requirements for progressing from one phase to the next as well as those for moving beyond selected hold points or milestones within a given phase. It also describes the controls in place that will assure the as-tested status of each system is known and that will track modifications, including retest requirements, deemed necessary for systems undergoing or already having completed specified testing. Additionally, the startup manual delineates the qualifications and responsibilities of the different positions within the startup group. The startup administrative procedures are intended to supplement normal plant administrative procedures by addressing those concerns that are unique to the startup program or that are best approached in a different manner. To avoid confusion, the startup program will attempt to be consistent with normal plant procedure where practical. The plant staff will typically carry out their duties according to normal plant procedures. However, in areas of potential conflict with the goals of the startup program, the startup manual or the individual test procedures will address the required interface. See Subsection 14.2.13.2 for COL License Information Requirements.

14.2.5 Review, Evaluation, and Approval of Test Results

Individual test results are evaluated and reviewed by cognizant members of the startup group. Test exceptions or acceptance criteria violations are communicated to the affected and responsible organizations who will help resolve the issues by suggesting corrective actions, design modifications, and retests. GE and others outside the plant staff organization, as appropriate, will have the opportunity to review the results for conformance to predictions and expectations. Test results, including final resolutions, are then reviewed and approved by designated startup group supervisory personnel. Final approval is obtained from the SCG and the appropriate level of plant management as defined in the startup administrative manual. The SCG and the designated level of plant management will also have responsibility for final review and approval of overall test phase results and of that for selected milestones or hold points

within the test phases. See Subsection 14.2.13.2 for COL License Information Requirements.

14.2.6 Test Records

Initial test program results are compiled and maintained according to the startup manual, plant administrative procedures, and applicable regulatory requirements. Test records that demonstrate the adequacy of safety-related components, systems and structures shall be retained for the life of the plant. Retention periods for other test records will be based on consideration of their usefulness in documenting initial plant performance characteristics.

14.2.7 Conformance of Test Program with Regulatory Guides

The NRC Regulatory Guides listed below were used in the development of the initial test program and the applicable tests comply with these guides except as noted. The applicable revisions of the regulatory guides listed below can be found in Table 1.8-20.

- (1) Regulatory Guide 1.68--*Initial Test Programs for Water-Cooled Nuclear Power Plants.*
- (2) Regulatory Guide 1.68.1--*Preoperational and Initial Startup Testing of Feedwater and Condensate Systems for Boiling Water Reactor Power Plants.*
- (3) Regulatory Guide 1.68.2--*Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants.*
- (4) Regulatory Guide 1.68.3--*Preoperational Testing of Instrument and Control Air Systems.*
- (5) Regulatory Guide 1.20--*Comprehensive Vibration Assessment Program for Reactor Internals During Preoperation and Initial Startup Testing.*
- (6) Regulatory Guide 1.41--*Preoperational Testing of Redundant Onsite Electric Power Systems to Verify Proper Load Group Assignments.*

- (7) Regulatory Guide 1.52--*Design, Testing, and Maintenance Criteria for Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants.*
- (8) Regulatory Guide 1.56--*Maintenance of Water Purity in Boiling Water Reactors.*
- (9) Regulatory Guide 1.95--*Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release.*
- (10) Regulatory Guide 1.108--*Periodic Testing of Diesel Generators Used as Onsite Electric Power Systems at Nuclear Power Plants.*
- (11) Regulatory Guide 1.139--*Guidance for Residual Heat Removal.*
- (12) Regulatory Guide 1.140--*Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Absorption Units of Light Water Cooled Nuclear Power Plants.*

14.2.8 Utilization of Reactor Operating and Testing Experience in the Development of Test Program

Since every reactor/plant in a GE BWR product line is an evolutionary development of the previous plant in the product line (and each product line is an evolutionary development from the previous product line), it is evident that the ABWR plants have the benefits of experience acquired with the successful and safe startup of more than 30 previous BWR/1/2/3/4/5/6 plants. The operational experience and knowledge gained from these plants and other reactor types has been factored into the design and test specifications of GE supplied systems and equipment that will be demonstrated during the preoperational and startup test programs. Additionally, reactor operating and testing experience of similar nuclear power plants obtained from NRC Licensee Event Reports and through other industry sources will be utilized to the extent practicable in developing and carrying out the initial test program.

14.2.9 Trial Use of Plant Operating and Emergency Procedures

To the extent practicable throughout the pre-operational and initial startup test program, test procedures will utilize operating, emergency, and abnormal procedures where applicable in the performance of tests. The use of these procedures is intended to do the following:

- (1) prove the specific procedure or illustrate changes which may be required;
- (2) provide training of plant personnel in the use of these procedures; and
- (3) increase the level of knowledge of plant personnel on the systems being tested.

A testing procedure utilizing an operating, emergency, or abnormal procedure will reference the procedure directly, extract a series of steps from the procedure, or both in a way that is optimum to accomplishing the above goals while efficiently performing the specified testing.

14.2.10 Initial Fuel Loading and Initial Criticality

Fuel loading and initial criticality are conducted in a very controlled manner in accordance with specific written procedures as part of the startup test phase (see Subsection 14.2.12.2). Approval for commencement of fuel loading is granted by the NRC after it has been verified that all prerequisite testing has been satisfactorily completed. However, there may be unforeseen circumstances that arise that would prevent the completion of all preoperational testing (including the review and approval of the test results) that would not necessarily justify the delay of fuel loading. Under such circumstances, the applicant referencing the ABWR design may decide to request permission from the NRC to proceed with fuel loading. If portions of any preoperational tests are intended to be conducted, or their results approved, after commencement of fuel loading, then the following shall be documented in such a request: (1) list each test; (2) state which portions of each test will be delayed until after fuel loading; (3) provide technical justification for delaying these portions; and (4) state when each test will be completed and the results approved.

See Subsection 14.2.13.2 for COL License information requirements.

testing at lower power levels should generally be performed prior to that at higher power levels. The detailed testing schedule will be generated by the applicant referencing the ABWR Standard Plant design and will be made available to the NRC prior to actual implementation. The schedule will then be maintained at the job site so that it may be updated and continually optimized to reflect actual progress and subsequent revised projections. *See Subsection 14.2.13.2 for*

COL License information requirements.

14.2.12 Individual Test Descriptions

14.2.12.1 Preoperational Test Procedures

The following general descriptions relate the objectives of each preoperational test. During the final construction phase, it may be necessary to modify the preoperational test methods as operating and preoperational test procedures are developed. Consequently, methods in the following descriptions are general, not specific.